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MX-774
GROUND TO GROUND MISSILE

ACTIVITY

CVAC REPORT 1496-19

SEPTEMBER AND OCTOBER 1948

CONSOLIDATED VULTEE

SAN DIEGO DIVISION, SAN DIEGO, CALIFORNIA

CONFIDENTIAL

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NOTICE

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FOREWORD

THE MX-774, UNDER DEVELOPMENT BY CONSOLIDATED VULTEE AIRCRAFT CORPORATION AT SAN DIEGO, CALIFORNIA FOR THE U. S. AIR FORCE IS A GUIDED MISSILE INTENDED FOR UPPER ATMOSPHERE SOUNDING. FROM AN ORIGINAL STUDY AND RESEARCH PROGRAM HAS EVOLVED THE MANUFACTURE OF THREE FLIGHT TEST MISSILES; TWO OF WHICH, AFTER EXTENSIVE SERVICE TESTS, WERE LAUNCHED SUCCESSFULLY AT WHITE SANDS PROVING GROUND, LAS CRUCES, NEW MEXICO. THE THIRD MISSILE IS CURRENTLY UNDERGOING STATIC TESTS AT CONVAIR'S POINT LOMA FACILITY AT SAN DIEGO.

A BRIEF BUT COMPREHENSIVE REPORT ON THE PROJECT RELATING TO PROPULSION, STABILIZATION, CONTROL AND TEST PROGRAMS IS ISSUED AT INTERVALS TO RECORD CURRENT ACTIVITIES.

THIS IS THE NINETEENTH IN A SERIES OF ACTIVITY REPORTS RELATING TO THE U. S. AIR FORCE MX-774 PROJECT AND COVERS THE PERIOD BETWEEN 1 SEPTEMBER AND 31 OCTOBER 1948.

REPORT CONTENTS

ILLUSTRATIONS

SUMMARY

MX-774 Flight Test Missile No. 2 was successfully launched from the Convair launching table at White Sands Proving Ground, Las Cruces, New Mexico on 27 September 1948. A preliminary coverage of the flight test results is presented in Section IV of this report.

A detailed study was made of the portion of flight No. 2 telemetered records which concerned operation of the stabilization systems and is summarized in Section III of this report.

Flight Test Missile No. 3 was completed and delivered to the simulator laboratory for radio and electrical check on 19 October 1948. This program was concluded on 28 October and the missile delivered to the static test facility on Point Loma to undergo tests in conformance with static test program dated 27 October 1948.

During October, the liquid oxygen pump and service lines were removed from missile No. 3 and tests were conducted to study the characteristics of oxygen pump cavitation and its effect on the propellant system. The results of one typical cavitation test are shown in Figure 11 on Page 17.

An initial release of flight test data concerning missile No. 2 was forwarded to the Air Material Command on 30 October 1948.

A 16mm documentary sound film covering flight No. 2 was completed.

The next Activity Report, 1496-20, will include the period 1 November through 31 December 1948.

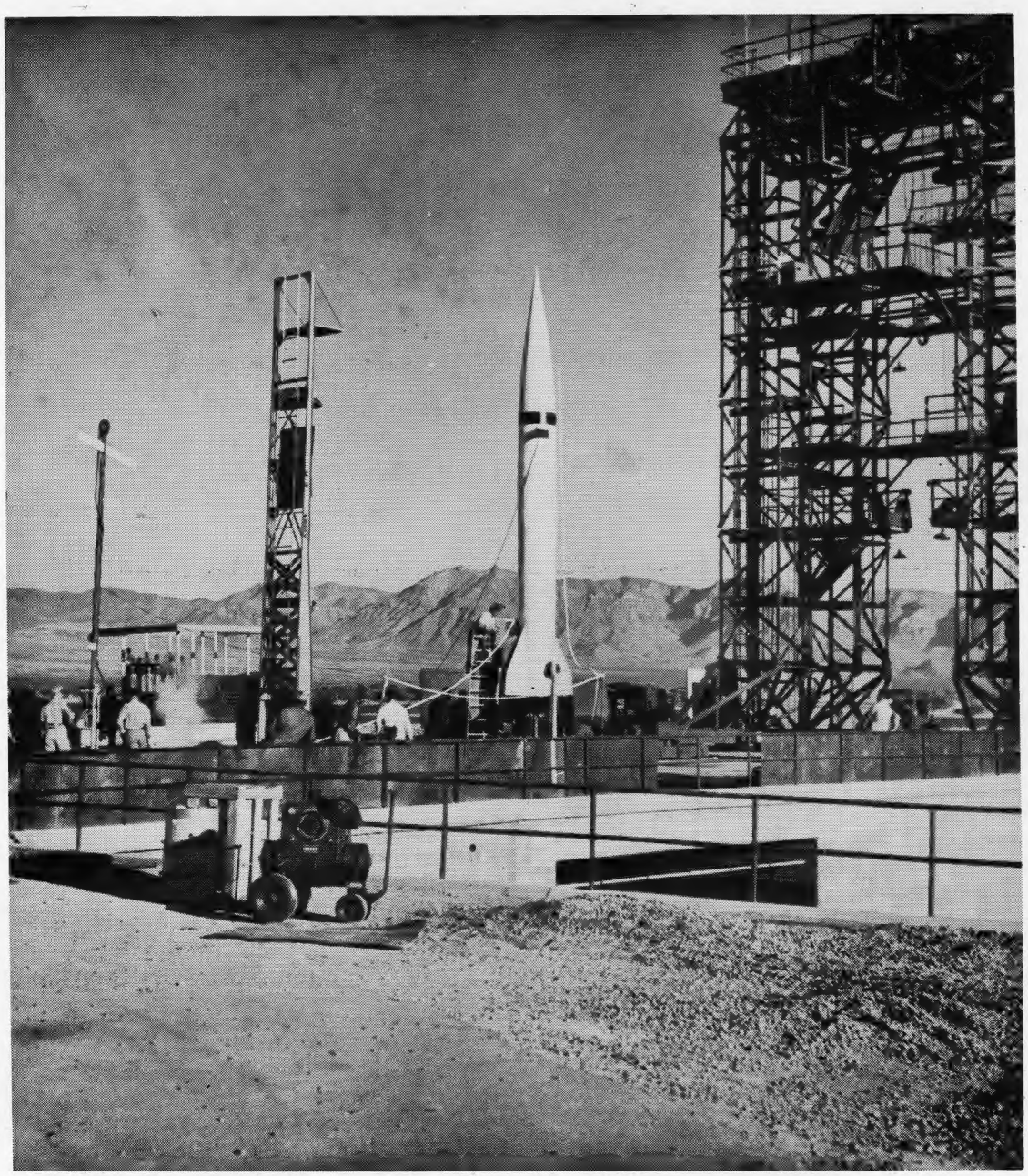

FIG. 1 - U.S. AIR FORCE MX-774 FLIGHT TEST MISSILE NO. 2 ON LAUNCHING TABLE DURING OPERATIONAL TESTS - WHITE SANDS PROVING GROUND, LAS CRUCES, NEW MEXICO - SEPTEMBER 1948 - SERVICE GANTRY IS SHOWN AT RIGHT

SECTION I

DESCRIPTION OF MISSILE

A. GENERAL

THE U. S. AIR FORCE MX-774 FLIGHT TEST MISSILE IS A SELF-LAUNCHED, HIGH ALTITUDE SUPERSONIC ROCKET PROJECTILE PROPELLED BY AN ALCOHOL/LIQUID OXYGEN ENGINE OF 8000 POUNDS THRUST. IT IS BEING DEVELOPED TO STUDY POWER PLANT, STABILIZATION, CONTROL, AERODYNAMIC AND TRAJECTORY PROBLEMS. FIGURES 1 AND 2 SHOW NO. 2 MISSILE ON THE LAUNCHING TABLE AT WHITE SANDS PROVING GROUND.

DESCRIPTIVE COVERAGE OF THE MX-774 IS PRESENTED IN CONVAIR REPORT NO. 1496-18.

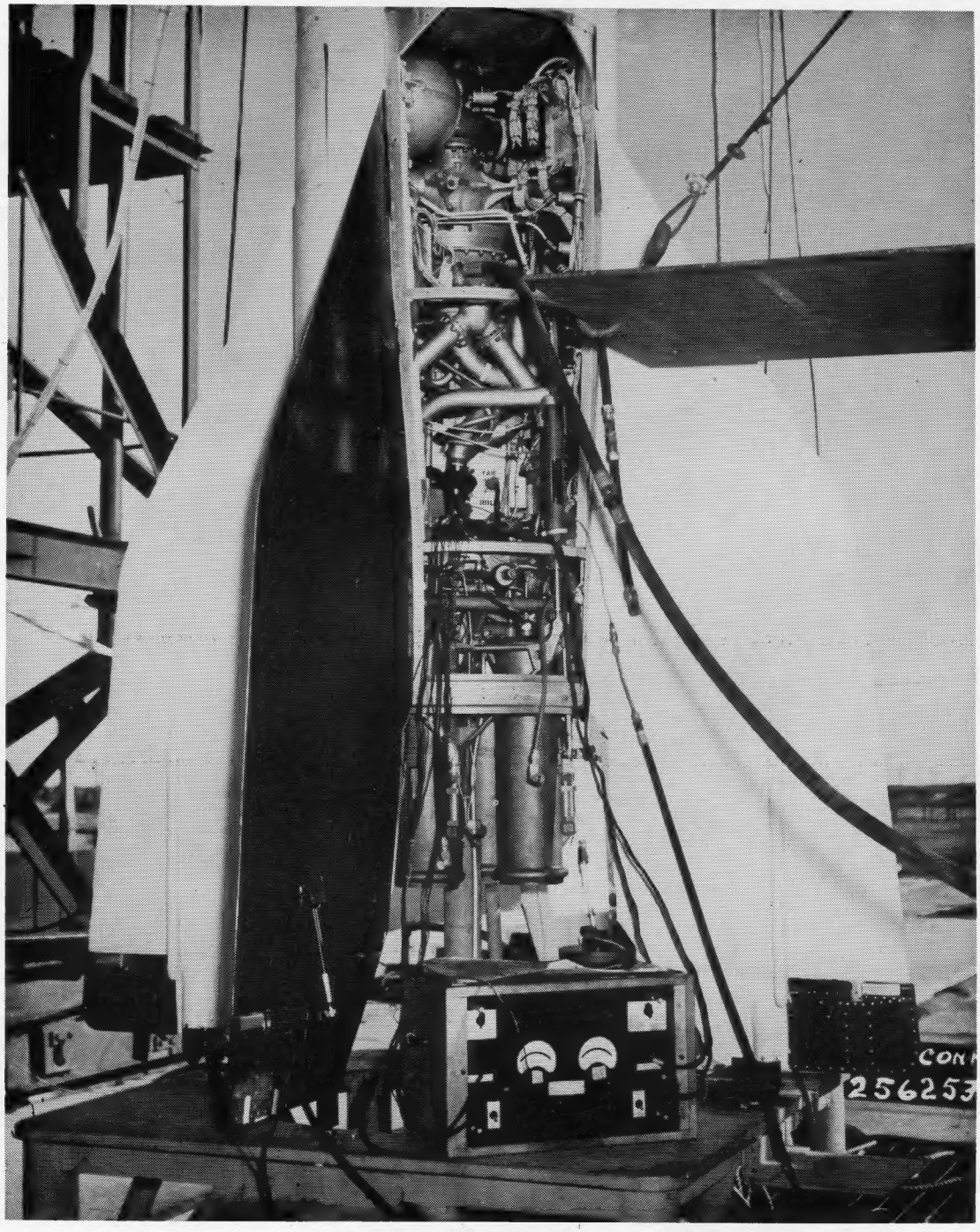

FIG. 2 - U.S. AIR FORCE MX-774 FLIGHT TEST MISSILE NO. 2 EMPENNAGE SECTION WITH ACCESS PANELS REMOVED DURING POWER PLANT OPERATIONAL TESTS - WHITE SANDS PROVING GROUND, LAS CRUCES, NEW MEXICO - SEPTEMBER 1948

SECTION II

DESIGN AND FABRICATION

A. GENERAL

MX-774 Flight Test Missile No. 2 was removed from the static test tower on Point Loma 1 September and delivered to Convair experimental shop for miscellaneous cleanup work, painting, and prepared for shipment to White Sands Proving Ground, Las Cruces, New Mexico.

The missile was loaded for transport to White Sands on 8 September 1948. Transportation and security was furnished by U. S. Marine Corps, Camp Pendleton, California.

Flight Test Missile No. 3 was completed and delivered to the simulator laboratory for radio and electrical check on 19 October 1948. This program was concluded on 28 October and the missile delivered to the static test facility on Point Loma.

B. PROPULSION SYSTEM

The liquid oxygen pump and service lines were removed from missile No. 3 and tests were conducted to study the characteristics of oxygen pump cavitation and its effect on the propellant system. The tests were conducted at the propulsion laboratory and concluded on 26 October, after which the system was reinstalled in the missile before its delivery to the static test facility.

A new type liquid oxygen level gage has been constructed and will be installed in time for the static test.

C. STABILIZATION SYSTEM

A STABILIZATION AND CONTROL PROGRAM FOR THE POINT LOMA HOT RUN WAS ESTABLISHED. THE MISSILE WILL BE FREE IN YAW AND PITCH BUT LOCKED IN ROLL. ROLL INTELLIGENCE WILL BE GIVEN TO THE MISSILE BY INSTALLING THE FREE AND RATE ROLL GYROS ON AN OSCILLATING TABLE LOCATED OUTSIDE THE MISSILE. THIS TABLE WILL BE ROCKED BY FREQUENCIES OF 1 AND 2 CYCLES PER SECOND AND AMPLITUDE OF 4 DEGREES. RADIO COMMANDS OF 3 DEGREES AMPLITUDE WILL BE GIVEN IN PITCH AND YAW.

THREE NEW AMPLIFIERS FOR THE STABILIZATION SYSTEM WERE COMPLETED AND THREE SERVICE UNITS WERE REBUILT. TWO COMPLETE SETS OF STABILIZATION AND INTEGRAL AMPLIFIERS ARE NOW AVAILABLE.

D. TELEMETERING SYSTEM

CONSTRUCTION OF SEVEN SPARE SUB-CARRIER OSCILLATORS FOR NO. 3 MISSILE WAS COMPLETED.

A TRANSMITTER ISOLATION FILTER WAS CONSTRUCTED TO ALLOW ONE ANTENNA TO BE USED SIMULTANEOUSLY FOR THE 77- AND 86-MEGACYCLE TRANSMITTERS.

THE FLIGHT RECORD OF THE NO. 2 MISSILE INDICATED SOME DRIFTS OF SUB-CARRIER FREQUENCIES AFTER FILAMENT CHANGEOVER. IN AN EFFORT TO REMEDY THIS CONDITION VARIOUS TUBES WERE TRIED. THE 6AJ5 PROVED MORE SATISFACTORY, CONSEQUENTLY THE 6AK5 TUBES IN ALL STAGES OF THE SUB-CARRIER OSCILLATORS HAVE BEEN REPLACED WITH 6AJ5 TUBES RESULTING IN APPROXIMATELY 1/2 PERCENT FREQUENCY SHIFT WITH A 1-VOLT FILAMENT CHANGE.

E. COMMAND CONTROL

A DIPOLE ANTENNA HAS BEEN CONSTRUCTED FOR USE WITH THE COMMAND CONTROL TRANSMITTER. THIS ANTENNA WILL BE USED AT POINT LOMA AND OTHER FIELD TESTS.

SECTION III

DYNAMICS ANALYSES

A. STUDY OF TELEMETERED RECORDS - FLIGHT NO. 2

DURING THIS REPORT PERIOD A DETAILED STUDY WAS MADE OF THE PORTION OF FLIGHT NO. 2 TELEMETERED RECORDS WHICH CONCERNED OPERATION OF THE STABILIZATION SYSTEM AND IT IS SUMMARIZED AS FOLLOWS:

1. PITCH AND YAW ANGULAR MOTIONS IN FLIGHT WERE BOTH CHARACTERIZED BY SLIGHT OSCILLATIONS ABOUT A MEAN REFERENCE POSITION WHICH DIFFERED FROM THE MISSILE POSITION AT TIME OF LAUNCHING TO THE EXTENT INDICATED IN FIGURE 3. (THESE FIGURES ARE RELIABLE TO THE EXTENT THAT TELEMETERING OSCILLOGRAPH TRACES ARE DRIFTLESS AND CALIBRATIONS ARE ACCURATE).

TIME-SECONDS	PITCH	YAW	ROLL
0 (LAUNCHING REFERENCE)	0	0	0
7	+0.33°	+2.9°	+1.8°
13	0°	+2.3°	+2.0°
19	+0.44°	+2.9°	+2.5°
27	+0.55°	+2.3°	-0.75°
48	+0.55°	-0.58°	+1.0°

FIG. 3 - MISSILE ANGULAR REFERENCE POSITION DURING FLIGHT NO. 2 (REFERRED TO LAUNCHING POSITION OF GYROS)

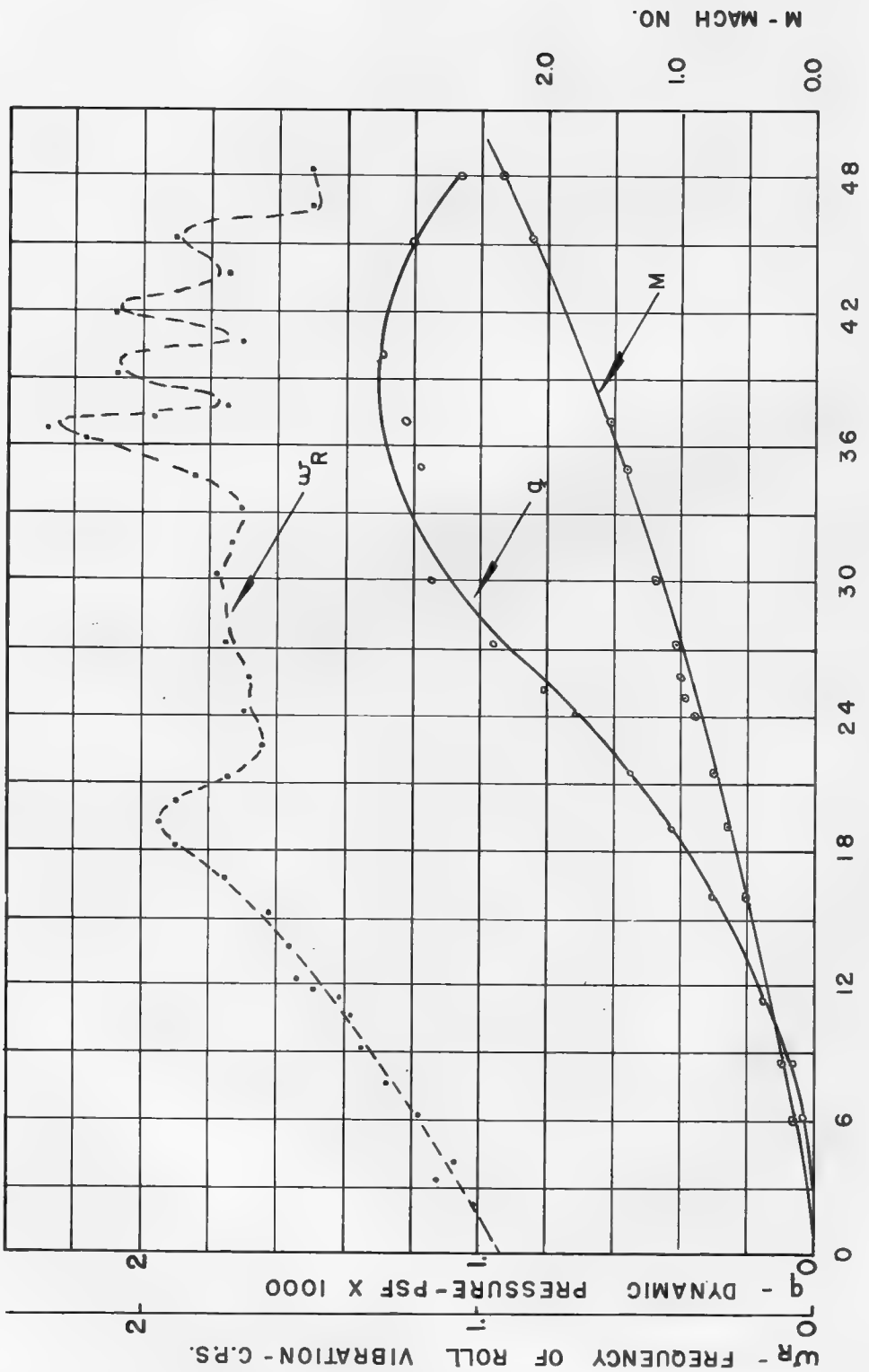

FIG. 4 - VARIATION OF FREQUENCY OF ROLL, MACH NUMBER AND DURING POWERED FLIGHT OF MISSILE NO. 2

THE OSCILLATIONS WERE OF THE SAME FREQUENCY AS THE ROLL OSCILLATIONS, INDICATING A CERTAIN AMOUNT OF INTERACTION BETWEEN SYSTEMS. FROM 0 TO 18 SECONDS, ±4 DEGREE ROLL, ±0.22 DEGREE PITCH AND ±0.4 DEGREE YAW OCCURRED; 21-25 SECONDS, ±15 DEGREE ROLL, ± 1.6 DEGREE PITCH, ±1.2 DEGREE YAW OCCURRED. A POSSIBLE REASON FOR THIS IS INTERACTION BETWEEN THE GYRO SYSTEMS. PITCH OSCILLATIONS REDUCED ABRUPTLY AT 25.6 SECONDS (MACH 1.0 ACCORDING TO WSPG ASKANIA CAMERA DATA); AT THE SAME TIME A SUDDEN ROLL EXCURSION OCCURRED, INDICATING THE POSSIBILITY OF A TRANSIENT CHANGE IN EFFECTIVENESS OF TABS.

2. ROLL MOTION WAS CHARACTERIZED BY CONTINUOUS OSCILLATIONS OF ±3 DEGREES TO ±4 DEGREES AMPLITUDE DURING SUBSONIC AND SUPERSONIC SPEEDS, AND OF ±13 DEGREES TO ±15 DEGREES DURING THE PERIOD 19 SECONDS TO 35 SECONDS (MACH 0.7 TO 1.4 WHICH INCLUDES THE TRANSONIC REGION). THESE OSCILLATIONS WERE OF A GREATER MAGNITUDE THAN HAD BEEN EXPECTED FROM ANALYSIS AND SIMULATOR PERFORMANCE. BASED ON AMPLITUDE AND PHASE COMPARISON OF TELEMETERED FLIGHT RECORD WITH PRE-FLIGHT "CHECK" RECORDS, THE STABILIZATION SYSTEM WAS NORMAL FROM VALVE SIGNAL TO VALVE POSITION AND FROM VALVE POSITION TO JET POSITION. DURING FLIGHT, THE RECORDS SHOW THE JET LAGGING THE ROLL MOTION BY A SMALL AMOUNT (2^{0} - 5^{0}). PRE-FLIGHT RECORDS SHOW THE NORMAL PHASE LEAD OF JET. THIS IS AN INDICATION THAT THE REQUIRED AMOUNT OF RATE-GYRO SIGNAL WAS NOT PRESENT DURING FLIGHT. TESTS HAVE BEEN COMPLETED ON MISSILE NO. 3 WHICH SHOW NORMAL PHASE LEAD OF 60 DEGREES TO 80 DEGREES WHEN ROLL OSCILLATIONS OF THE SAME AMPLITUDE AND FREQUENCY AS THOSE OF FLIGHT NO. 2 OCCUR, WITH THE JETS EITHER "COLD" OR "HOT".

3. THE EXISTENCE OF ROLL OSCILLATIONS DURING FLIGHT NO. 2 MADE IT POSSIBLE TO OBTAIN DESIRABLE INFORMATION CONCERNING THE TIME VARIATION AND MAGNITUDE OF LIFT COEFFICIENT OF THE DIRECTLY-ACTUATED TABS. IT CAN BE SHOWN THAT IF THE STABILIZATION SYSTEM HAS A LOW VALUE OF RATE SIGNAL (LOW DAMPING), THE FREQUENCY OF ROLL OSCILLATION, ω_R IS GIVEN APPROXIMATELY BY:

$$\omega_R = \sqrt{\frac{K\Phi}{K_\delta} \frac{(L_J + L_{TAB})}{I}} \qquad (1)$$

WHERE:

$\frac{K\phi}{K\delta}$ = DEGREES JET PER DEGREE OF ROLL (DETERMINED BY SERVO CONSTANTS.)

I = ROLL INERTIA

L_J = CONTROL TORQUE/RAD. JET DUE TO JET THRUST.

L_{TAB} = CONTROL TORQUE/RAD. JET DUE TO TABS.

FROM THIS EQUATION IT IS SEEN THAT THE FREQUENCY OF OSCILLATION VARIES AS L_{TAB} VARIES WITH "q". THIS OCCURRED DURING FLIGHT NO. 2 AS IS SEEN IN FIGURE 4. IN THE SUBSONIC REGION, THE FREQUENCY INCREASED FROM 0.95 TO 1.9 CPS AS THE MISSILE PICKED UP SPEED. IN THE SUPERSONIC REGION, THE AVERAGE FREQUENCY DECREASED AS "q" BEGAN TO DROP OFF. IN THE TRANSONIC REGION, THE FREQUENCY AND AMPLITUDE OF OSCILLATION WAS LIMITED BY MAXIMUM JET RATE AND POSITION (STOPS ON CYLINDERS) TO 1.8 CPS AT $\pm$13 TO $\pm$15 DEGREES, SO THAT EQUATION (1) DOES NOT HOLD.

A COMPARISON OF THE ω_R RECORDED IN FLIGHT AND THE ω_R AS CALCULATED FROM THE ORIGINALLY ESTIMATED TAB LIFT COEFFICIENT FOR "q" AS DETERMINED FROM WSPG ASKANIA CAMERA DATA IS GIVEN IN FIGURE 5.

TIME IN FLIGHT (SECONDS)	q (PSF) (FROM WSPG ASKANIA CAMERA DATA)	ω_R (CPS) FROM FLIGHT RECORD NO.2	ω_R (CPS) (CALCULATED)
3.9	10.6	1.08	0.98
6.1	34	1.20	1.04
8.4	73	1.32	1.08
11.4	151	1.46	1.20
15.9	302	1.70	1.40
18.9	430	1.95	1.60

FIG. 5 - COMPARISON OF ROLL OSCILLATION FREQUENCY AS RECORDED IN FLIGHT NO. 2 AND AS CALCULATED FROM ORIGINALLY ESTIMATED TAB LIFT COEFFICIENT.

THE DISCREPANCIES INDICATE THE ORIGINAL ESTIMATE ON THE TAB EFFECTIVENESS WAS SOMEWHAT LOW.

SECTION IV

TEST OPERATIONS

FLIGHT TEST MX-774 No. 2

A. GENERAL

THE SECOND MX-774 WAS LAUNCHED FROM THE CONVAIR LAUNCHING TABLE AT 1405 MST (2:05 PM) ON 27 SEPTEMBER 1948 AT WHITE SANDS PROVING GROUND, LAS CRUCES, NEW MEXICO. FLIGHT PHOTOGRAPHS ARE SHOWN AS FIGURES 6, 7, 8 AND 9.

A PRELIMINARY REDUCTION OF RADAR AND THEODOLITE DATA SHOWS AN ALTITUDE OF APPROXIMATELY 54,000 FEET AND A VELOCITY OF 2,500 FEET/SECOND WAS REACHED BEFORE POWER FAILURE OR BURNOUT OCCURRED AT 48 SECONDS. PEAK OCCURRED AT APPROXIMATELY 116 SECONDS. THERE IS A WIDE DISCREPANCY AS TO THE ALTITUDE REACHED BETWEEN PRELIMINARY THEODOLITE AND TELESCOPE DATA. ASKANIA THEODOLITE DATA PLACED THE PEAK AT APPROXIMATELY 23 MILES AND TELESCOPE DATA AT 33 MILES. FINAL FLIGHT PATH AND VELOCITY DATA FROM THESE SOURCES HAS SO FAR NOT BEEN MADE AVAILABLE FOR CONVAIR ANALYSIS.

AT APPROXIMATELY 98 SECONDS THE BATTERY FAILED AS EVIDENCED BY STOPPAGE OF RECORDING CAMERA, TELEMETERING AND RADAR BEACON TRANSMISSION AND INABILITY TO EITHER RELEASE THE RECOVERY PARACHUTE OR DETONATE THE DESTRUCTION CHARGE.

DURING DECENT, AT APPROXIMATELY 203 SECONDS, THE MISSILE WAS SEVERED IN TWO PIECES AT THE LOCATION OF THE DESTRUCTION CHARGE. PRESUMABLY, THE DESTRUCTION CHARGE WAS SET OFF BY IMPACT OF THE LOWER LIQUID OXYGEN TANK BULKHEAD WHICH FAILED UNDER EXCESSIVE PRESSURE IN THE TANK CAUSED BY OXYGEN BOIL-OFF. IMPACT OCCURRED AT 296 SECONDS, 2 1/2 MILES NORTHEAST OF THE LAUNCHING TABLE.

FIG. 9

FIG. 8

FIG. 7

FIG. 6

U.S. AIR FORCE MX-774 FLIGHT TEST MISSILE NO. 2
- WHITE SANDS PROVING GROUND, LAS CRUCES, NEW MEXICO - 27 SEPTEMBER 1948

AN INITIAL RELEASE OF FLIGHT TEST DATA CONCERNING MISSILE NO. 2 WAS FORWARDED TO THE AIR MATERIAL COMMAND 30 OCTOBER 1948.

A 16MM DOCUMENTARY SOUND FILM COVERING THE FLIGHT WAS COMPLETED.

B. PROPULSION SYSTEM RESULTS

THE OPERATION OF THE PROPULSION SYSTEM WAS SATISFACTORY UP TO THE TIME OF BURNOUT AT 48 SECONDS. "MISSILE LIFT" OCCURRED AT 6.7 SECONDS AFTER CLOSING THE FIRING SWITCH. THE PERFORMANCE OF THE MISSILE DURING THE PROPULSION PHASE WAS SLIGHTLY HIGHER THAN EXPECTED. THE FORE AND AFT ACCELERATION OBTAINED FROM TELEMETERING DATA IS PRESENTED IN FIGURE 10. THIS DATA INDICATES THAT AT 5 SECONDS AFTER MISSILE LIFT THE VELOCITY WAS INCREASING AT A RATE OF 1.3 G. ACCELERATION BECAME CONSTANT AT 1.6 G BETWEEN 25 AND 35 SECONDS. FOLLOWING 35 SECONDS ACCELERATION GRADUALLY INCREASED TO A VALUE OF 2.8 G JUST PRIOR TO BURNOUT.

DURING THE POWERED FLIGHT THE OPERATING PRESSURES STABILIZED AT THE FOLLOWING VALUES:

ROCKET CHAMBER PRESSURE.	285 PSI
HYDROGEN PEROXIDE TANK PRESSURE. .	385 PSI
LIQUID OXYGEN TANK PRESSURE. . . .	22 PSI
LIQUID OXYGEN PUMP INLET PRESSURE.	25 PSI
LIQUID OXYGEN MANIFOLD PRESSURE AT PROPELLANT VALVE	385 PSI
ALCOHOL MANIFOLD PRESSURE AT PROPELLANT VALVE	345 PSI

NEITHER THE ROCKET CHAMBER PRESSURES NOR ALCOHOL MANIFOLD PRESSURES SHOW ANY FLUCTUATIONS DUE TO THE ABNORMAL DRAIN OF ALCOHOL TO THE STABILIZATION HYDRAULIC SYSTEM DURING THE PERIOD OF SEVERE ROLL HUNT.

SECONDARY AND PRIMARY NITROGEN PRESSURES WERE NORMAL UP TO BURNOUT. EVEN WITH ABNORMAL DRAIN OF SECONDARY NITROGEN FOLLOWING BURNOUT, THE HYDROGEN PEROXIDE TANK PRESSURE WAS 320 PSI AT 76 SECONDS (THEORETICAL BURNOUT TIME). PRIMARY NITROGEN PRESSURE AT 38 SECONDS WAS 140 PSI. IT WAS PREDICTED TO BE EMPTY AT THIS TIME.

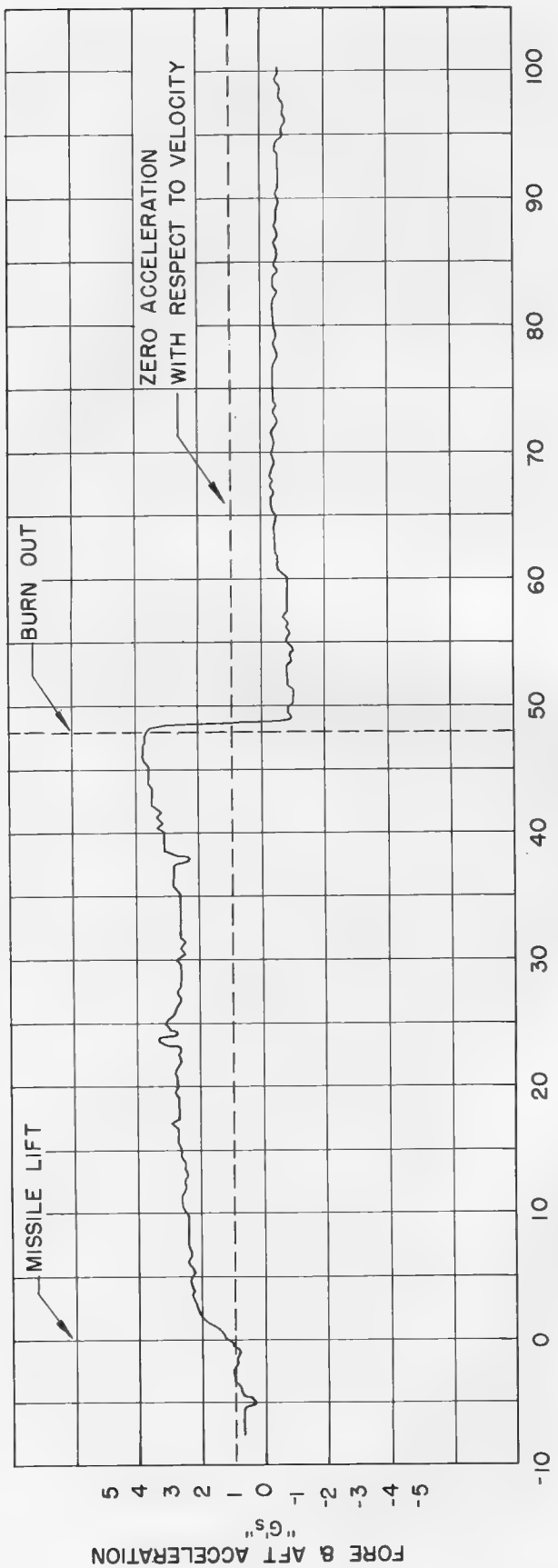

FIG. 10 - FORE AND AFT ACCELERATION DATA OBTAINED FROM TELEMETERING RECORDS - FLIGHT TEST MISSILE NO. 2

THE SPECIFIC CAUSE OF THE PREMATURE BURNOUT IS AT PRESENT UNKNOWN. A REDUCTION OF TELEMETERING TRACES SUPPORTED THE THEORY THAT THE LIQUID OXYGEN PROPELLANT VALVE CLOSED. THE POSSIBILITY THAT LIQUID OXYGEN PUMP CAVITATION OCCURRED WAS INVESTIGATED BY REMOVING THE OXYGEN PUMP AND SERVICE LINES FROM MISSILE NO. 3 IN ORDER TO STUDY THE CHARACTERISTICS OF OXYGEN PUMP CAVITATION AND ITS EFFECT ON THE PROPELLANT SYSTEM. THE TESTS, CONDUCTED AT THE CONVAIR PROPULSION LABORATORY WERE CONCLUDED ON 27 OCTOBER 1948. THE RESULTS OF ONE TYPICAL CAVITATION TEST ARE SHOWN IN FIGURE 11. IT WAS FOUND THAT PUMP CAVITATION OF LIQUID OXYGEN CAUSES QUITE GRADUAL VARIATIONS IN BOTH FLOW AND PRESSURES. NO VIOLENT PRESSURE CHANGES WERE EVER OBSERVED. THIS STRONGLY TENDS TO ELIMINATE CAVITATION AS A POSSIBLE CAUSE OF ENGINE FAILURE.

TWO POSSIBILITIES WHICH WOULD CAUSE THE OXYGEN VALVE TO CLOSE ARE:

1. BREAKING OF THE NITROGEN LINE SUPPLYING DOME PRESSURE TO THIS VALVE.

2. BREAKING OF THE ELECTRIC WIRE ENERGIZING THE MAGNETIC VALVE ADMITTING THE NITROGEN TO THIS LINE.

C. STABILIZATION SYSTEM RESULTS

THE MISSILE WAS STABLE THROUGHOUT THE FLIGHT. SMALL OSCILLATIONS OCCURRED IN PITCH AND YAW AND RATHER LARGE OSCILLATIONS IN ROLL THROUGH PART OF THE FLIGHT.

A PRELIMINARY CHECK OF THE TELEMETERING RECORD TRACES INDICATES THE FOLLOWING RESULTS:

PITCH ATTITUDE	(REFERENCE FT 774-178)
±3/4 DEGREES	0 TO 20 SECONDS
±1 1/2 DEGREES	20 TO 40 SECONDS
±1/2 DEGREE	40 TO 50 SECONDS (END OF CONTROL)

YAW ATTITUDE	(REFERENCE FT 774-179)
±1/4 DEGREE	0 TO 4 SECONDS
±1 1/2 DEGREES	4 TO 9 SECONDS
±1/2 DEGREE	9 TO 18 SECONDS
±2 DEGREES	18 TO 40 SECONDS
±1 DEGREE	40 TO 50 SECONDS

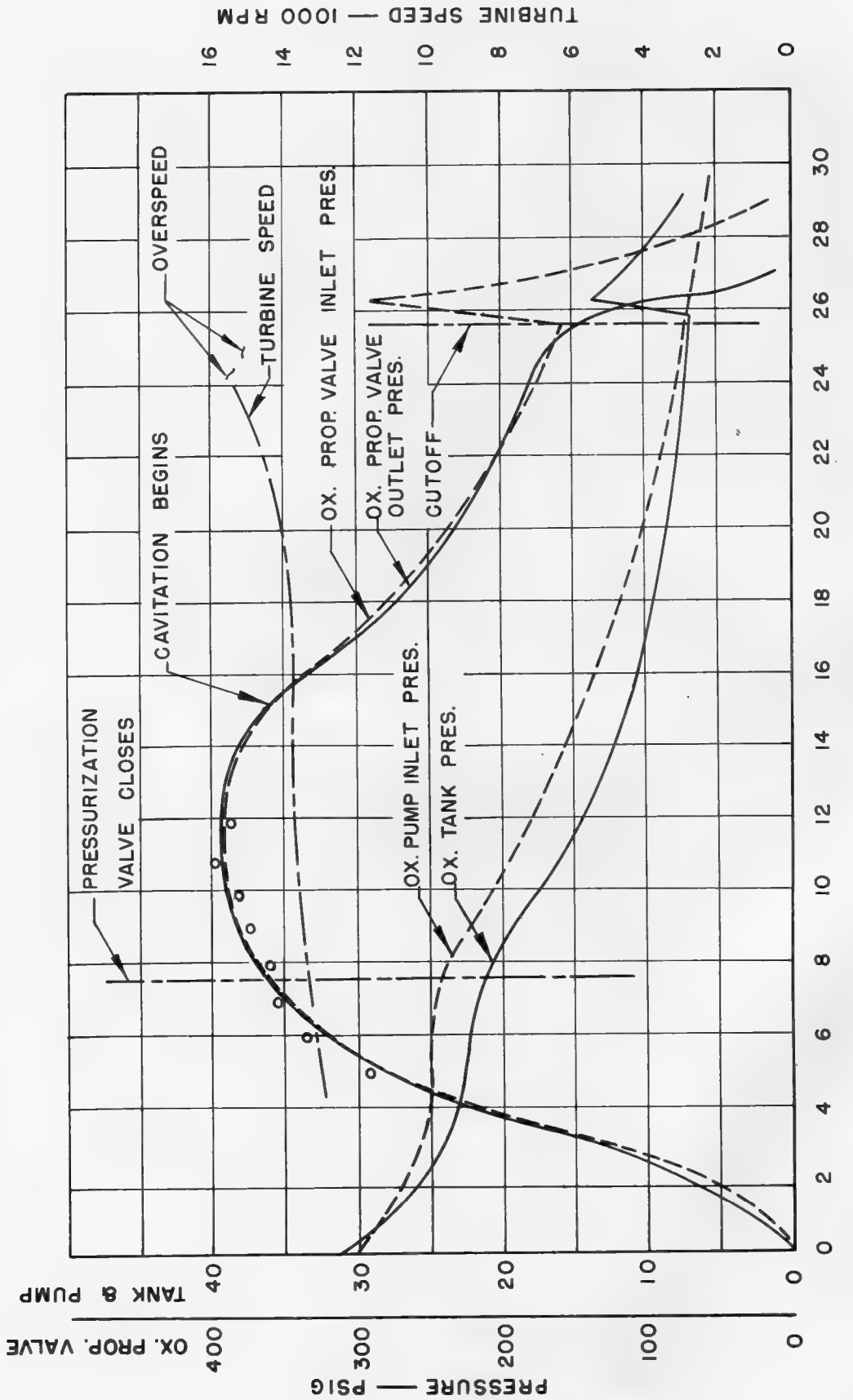

FIG. 11 - CAVITATION TEST RESULTS LIQUID OXYGEN PUMP - MX-774 MISSILE

ROLL ATTITUDE	(REFERENCE FT 774-177)
±3 DEGREES	0 TO 20 SECONDS
±10 DEGREES	20 TO 40 SECONDS
±2 DEGREES	40 TO 50 SECONDS

FURTHER ANALYSIS OF THE TELEMETERING RECORDS WILL BE COMPARED WITH DATA OBTAINED FROM RECENTLY CONCLUDED GROUND TESTS AT THE SIMULATOR LABORATORY IN AN EFFORT TO DETERMINE THE EXACT CAUSE OF THE ROLL OSCILLATION.

D. TELEMETERING SYSTEM RESULTS

TELEMETERING RECORDS OBTAINED WERE EXCELLENT EXCEPT FOR SOME DRIFT TO THE ZERO REFERENCE LINE.

DATA RECORDED BY TELEMETERING INCLUDED MISSILE ATTITUDE, ROCKET MOTOR POSITION (PITCH, ROLL AND YAW), STABILIZATION AMPLIFIER OUTPUT AND SERVO CONTROL VALVE POSITION.

E. COMMAND CONTROL RESULTS

COMMAND CONTROL EQUIPMENT INSTALLED IN MISSILE NO. 2 CHECKED OUT SATISFACTORILY BEFORE FLIGHT TEST. IT WAS INTENDED TO GIVE COMMAND SIGNALS ONLY WHEN NECESSARY IN ORDER TO KEEP THE MISSILE WITHIN THE BOUNDARIES OF THE RANGE. AS THE MISSILE DID NOT DEVIATE APPRECIABLY FROM THE DESIRED COURSE, NO RADIO COMMAND WAS GIVEN. BURNOUT OCCURRED BEFORE THE PRESET PROGRAM COMMAND WAS TO BECOME OPERATIVE, CONSEQUENTLY, PRESET COMMAND WAS NOT EFFECTIVE. SOME DIFFICULTY WAS EXPERIENCED DURING PRE-FLIGHT CHECKS WHEN SEVERAL TUBES WERE BURNED OUT DUE TO POOR REGULATION IN THE FILAMENT POWER SUPPLY.

SECTION V

PROJECTED WORK PROGRAM

WORK TO BE INITIATED, CONTINUED OR COMPLETED DURING THE PERIOD 1 NOVEMBER THROUGH 31 DECEMBER 1948 INCLUDES:

1. COMPLETION OF STATIC TEST PROGRAM - MX-774 FLIGHT TEST MISSILE NO. 3 AT POINT LOMA.

2. REMOVE MISSILE FROM STATIC TEST TOWER AND TRANSPORT TO CONVAIR EXPERIMENTAL SHOP FOR MISCELLANEOUS CLEANUP WORK, PAINTING, AND PREPARE FOR SHIPMENT TO WHITE SANDS PROVING GROUND. TENTATIVE DATE FOR LEAVING SAN DIEGO, 19 NOVEMBER. TRANSPORTATION AND SECURITY TO BE FURNISHED BY U. S. MARINE CORPS, CAMP PENDLETON, CALIFORNIA.

3. CONDUCT FLIGHT TEST IN ACCORDANCE WITH "DETAILED PROGRAM FOR THE FLIGHT TEST OF THE THIRD U. S. AIR FORCE MX-774 8,000-POUND THRUST MISSILE".

4. COMPLETION OF CONVAIR REPORT ZN-6002-010 ENTITLED "INVESTIGATION OF LONG RANGE TRAJECTORIES - COMPLETION REPORT".

5. COMPLETION OF CONVAIR REPORT ZN-6002-019 ENTITLED "CONVAIR PRECISION RANGE SYSTEM".

6. COMPLETION OF CONVAIR REPORT ZU-6002-001 ENTITLED "DYNAMIC ANALYSIS OF STABILIZATION SYSTEM".

SECTION VI

REFERENCE DATA

CVAC REP. NO.	TITLE	RELEASE DATE
275-805	Power Plant - Oxygen Tank Static and Pressure Test of	17 Oct 47
275-824	Fin - Army Test Vehicle - Static Test of	18 Jun 47
301-126	Fuel System MX-774 Supersonic Test Vehicle Tests of Pressurization by Vaporization of Liquid Oxygen	5 Dec 47
346-16	Study of Propellants of High Specific Impulse	25 Sep 46
346-17	Calculation of Skin Temperatures of the Supersonic Test Vehicle and the Supersonic Ground-to-Ground Missile	25 Nov 46
1496-1	MX-774 Activity Report	May 46
1496-2	MX-774 Activity Report	Jun 46
1496-3	MX-774 Activity Report	Jul 46
1496-4	MX-774 Activity Report	Aug 46
1496-5	MX-774 Activity Report	Sep 46
1496-6	MX-774 Activity Report	Oct 46
1496-7	MX-774 Activity Report	Nov 46
1496-8	MX-774 Activity Report	Dec 46
1496-9	MX-774 Activity Report	Jan 47

CVAC REP. NO.	TITLE	RELEASE DATE
1496-10	MX-774 ACTIVITY REPORT	MAR 47
1496-11	MX-774 ACTIVITY REPORT	APR 47
1496-12	MX-774 ACTIVITY REPORT	JUN 47
1496-13	MX-774 ACTIVITY REPORT	AUG 47
1496-14	MX-774 ACTIVITY REPORT	DEC 47
1496-15	MX-774 ACTIVITY REPORT	JAN 48
1496-16	MX-774 ACTIVITY REPORT	MAR 48
1496-17	MX-774 ACTIVITY REPORT	JUN 48
1496-18	MX-774 ACTIVITY REPORT	OCT 48
4002	PRELIMINARY ANALYSIS OF VIBRATING REED GYROSCOPE	21 JUN 46
4008	PROGRESS REPORT OF PRECISION GYROSCOPE	29 JUL 46
4009	POSITIVE ION ACCELEROMETER - ESTIMATES OF OUTPUT VOLTAGE AND REQUIRED XENON PRESSURE	13 AUG 46
4012	THE USE OF THE CYCLOTRON PRINCIPLE FOR INCREASING ACCELEROMETER TRANSIT	22 AUG 46
4013	MAGNETIC NAVIGATION INVESTIGATION	28 AUG 46
4014	MISSILE VELOCITY DETERMINATIONS FROM DOPPLER EFFECT	23 AUG 46
4016	THREE-GROUND-STATION RADAR NAVIGATIONAL SYSTEMS FOR A PROJECTILE-TYPE MISSILE	6 SEP 46
4018	IONOSPHERE REFRACTION ERROR ESTIMATE OF SIGHTING ERROR AND INCREASE IN PHASE VELOCITY	5 NOV 46
4019	INVESTIGATION OF MAXIMUM ERROR OF THREE - GROUND STATION NAVIGATIONAL SYSTEM	8 NOV 46
4024	PROPORTIONAL RADIO CONTROL	10 SEP 46
4025	TRANSMITTING ANTENNAS FOR VHF HYPERBOLIC GRID GUIDANCE CONTROL SYSTEM	15 OCT 46

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ZN-6002-018	DOPPLER SPEEDOMETER SYSTEM	2 MAR 48
ZN-6002-021	GUIDANCE SYSTEM COMPUTERS MX-774	14 JUN 48

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